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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/529,829	03/30/2005	Keith A. Struckman	D-4674 PCT	1661

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EXAMINER	
TAYONG, HELENE E	
ART UNIT	PAPER NUMBER
2611	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/529,829	STRUCKMAN, KEITH A.	
	Examiner	Art Unit	
	HELENE TAYONG	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 July 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-34* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *23 July 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-7, 9-17 and 19-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dogan et al (US 6018317) in view of Gardner et al (US 5299148).

(1) with regards to claims 1, 25 and 31;

Dogan et al discloses in (figs. 2A, 2B and 2C) a (method, apparatus, see abstract and system, col.7, lines52-54) for separating a plurality of co-channel, interfering signals of interest received by antennas of an antenna array (see abstract) (figs. 8A, 27 and 28) the method , apparatus and system comprises the steps of:

(a) forming a matrix in eigenspace based on samples of the signals received by each of the antennas of the antenna array, the matrix yielding an eigenstream for each signal of interest (fig. 2B (40), fig. 10, 180, col. 29, lines 14-67);

(b) processing the eigenstreams for each signal of interest to determine a set of optimal eigenweights for each signal of interest (fig. 11A, 202, col. 31, lines 15-67 and col. 32, lines 1-67) ;

(c) converting the optimal eigenweights for each signal to beam forming weights for each of the signals of interest (fig. 11A, 202, 204, col. 31, lines 65-67 and col. 32, lines 1-7) ; and

(d) processing a copy of the received signals using the beam forming weights for each co-channel, interfering signal to extract each signal (fig. 8A, 124.k, fig. 11B, 218) of interest from the received, interfering signals (fig. 11B, col. 31, lines 15-67 and col. 32, lines 1-67) ;

Dogan et al discloses all of the subject matter discussed above, but is silent about receiving the signals without any a priori knowledge of the signals.

However, Gardner et al in the same endeavor (extraction of signals) explicitly teach in col. 8, lines 58-65) that the present invention does not require a knowledge of the waveform or the direction -of-arrival of the signal-of-interest.

It would have been obvious to at the time the invention was made by one of ordinary skill to have incorporated the method of Gardner et al in the method of Dogan et al in order to process signals for extracting communications signals from environments containing uncorrelated co-channel interference, and for signal-selectvie direction finding. The motivation to incorporate the method of Gardner et al in the method of Dogan et al would be to improve reception of the desired signal (col. 1, lines 66-67).

(2) with regards to claims 2 and 26;

Dogan et al further discloses wherein step (b) comprises the steps of:

(e) determining the number of interfering signals of interest from the matrix (fig. fig. 2B, 40 and 38);

(f) establishing preliminary eigenweights for each signal eigenstream (fig. 11B, 212);

(g) processing each of the eigenstreams and their eigenweights to produce revised eigenweights for each eigenstream (figs. 11A and 11B and col. 31- lines 15-67);

(h) comparing the preliminary eigenweights to the revised eigenweights for each eigenstream to determine the differences between them (fig. 11, 218, method B, 2 and col.31, lines 15-67);

(i) repeating steps (g) and (g) only if the eigenweight differences exceed a predetermined value, and using the revised eigenweights from step (g) as the preliminary eigenweights when steps (g) and (h) are repeated ((fig. 11, 218, method B, 2 and col.31, lines 15-67);

(3) with regards to claims 3, 12, 27, 28 and 32;

Dogan et al further discloses wherein step (g) comprises the steps of:

(0) performing time domain processing on the eigenstreams (fig. 49 and 50); and

(k) performing frequency domain processing on the eigenstreams (fig. 45-47).

(4) with regards to claims 4 and 13;

(l) Dogan et al further discloses orthogonalizing each of the processed eigenstreams after they have been processed in steps (j) and (k) (fig. 11B, fig. 12, 126 and col. 34, lines 17-28, fig. 8A, 126 and fig. 16,).

(5) with regards to claims 5, 14, 19, 29 and 33;

Dogan et al further discloses wherein there is a beam forming network for each signal of interest to be separated from other interfering signals (fig. 4), each such network has a weighting circuit associated with each of the antennas of the array of antennas, the signals from each of the array of antennas (fig. 4A, 28) are input to the associated one of weighting circuits (44) in each of the networks, and wherein step (d) comprises the steps of:

(m) weighting the antenna signal input to each weighting circuit by the beam forming weights determined in step (c) for the signal of interest (fig. 4A, fig. 11, 204 and col. 31, lines 66-67, col. 32, lines 1-67); and

(n) summing the weighted antenna signals output from the weighting circuits in each network to separate the signal of interest (fig. 11A, 206, col. 32, lines 8-25).

(6) with regards to claims 6, 15, 20, 30 and 34;

(o) Dogan et al further discloses determining the direction from which each signal of interest is being received by the antennas of the antenna array using the beam forming weights determined in step (c) Fig. 4B, 50).

(7) with regards to claim 7;

Dogan et al further discloses wherein a correlation interferometer direction finding algorithm is used to determine the direction from which each signal of interest is being received.

(8) with regards to claims 9 and 16;

Dogan et al further discloses wherein step (a) comprises the steps of:

(p) forming a covariance matrix (fig. 2B, 40, fig. 10, 180) using samples of the signals received by each of the antennas of the antenna array (fig. 4A) ; and

(q) transforming the covariance matrix into the matrix in eigenspace to produce an eigenstream for each received signal of interest (fig. 4A, fig. 10, and fig. 11A and 11B).

(9) with regards to claim 10;

Dogan et al further discloses wherein the covariance matrix created in step (p) is transformed in step (q) into a matrix in eigenspace to produce a time domain eigenstream for each received signal of interest, and each eigenstream is defined by a steered eigenvector that is equal in length to the covariance matrix integration period (fig. 11B).

(10) with regards to claims 11 and 17;

Dogan et al further wherein step (q) is performed using a conventional Hermitian matrix decomposition technique (fig. 10, 182, col.29, lines51-67).

(11) with regards to claims 21, 22, 23 and 24;

Dogan et al further discloses wherein the beam forming weights determined (fig. 11A, 204) in step (c) can be used for extended periods of time and only need to be updated on an intermittent basis (col. 31, lines 66-67 and col. 32, lines 1-67).

3. Claims 8 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dogan et al (US 6018317) in view of Gardner et al (US 5299148) as applied in claims 6 and 12 above, and further in view of Papadias et al ("New adaptive blind equalization algorithms for constant modulus constellations", Acoustics, Speech, and Signal

Processing, 1994. ICASSP-94., 1994 IEEE International Conference on, Vol. Iii, 19-22 April 1994 Page(s):III/321-III/324 Vol.3).

(1) with regards to claims 8 and 18;

Dogan et al as modified by Gardner et al discloses all of the subject matter discussed above, but for explicitly teaching wherein either step (j) or (k) may be eliminated when there is a priori knowledge of a received signal being a constant modulus or non-constant modulus signal.

However, Papadias et al discloses a priori knowledge of a received signal being a constant modulus signal (see abstract).

It would have been obvious to one of ordinary skill in the art at the time of the invention to have incorporated the method of Papadias et al in the method of Dogan et al as modified by Gardner et al in order to provide an algorithm that escape from undesirable local minima of their cost function for the benefit of stability.

Conclusion

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Tsutsui et al (US 6385181) discloses an array antenna system of a wireless base station in CDMA mobile communications.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to HELENE TAYONG whose telephone number is (571)270-1675. The examiner can normally be reached on Monday-Friday 8:00 am to 5:30 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Liu Shuwang can be reached on 571-272-3036. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Helene Tayong/
Examiner, Art Unit 2611

June 9, 2008
/Shuwang Liu/
Supervisory Patent Examiner, Art Unit 2611